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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,115	04/14/2004	Douglas D. Coolbaugh	BUR920030087US1	3114
30449	7590	03/10/2006	EXAMINER	
SCHMEISER, OLSEN + WATTS			HU, SHOUXIANG	
3 LEAR JET LANE			ART UNIT	
SUITE 201			PAPER NUMBER	
LATHAM, NY 12110			2811	

DATE MAILED: 03/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/709,115	COOLBAUGH ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Shouxiang Hu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 30 December 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 4-7 and 9-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Pending Claims***

According to previous office actions, claims 1-20 are pending in this application; and claims 1-3 and 8 remain active in this office action.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3 and 8, as being supported by applicant's elected species, are rejected under 35 U.S.C. 102(e) as being anticipated by Li (Li et al., US 6,911,360).

Li discloses a resistor structure (Fig. 3), comprising: an electrically conductive region (64; silicide); a liner region (a portion of 78 that covers the region 64, which is readable as a liner region as it covers a surface of the layer 64 in a manner substantially same as that of the top liner portion 120 in the elected species of Fig. 1 of the instant invention); first and second contact regions (28 and 38), wherein the first contact region (28 or 38) is in direct physical contact with the liner region; and, wherein in response to a current flowing in the electrically conductive region, a void region in

therein expands due to electromigration so as to increase the resistance of the resistor structure (see col. 2, lines 1-20).

Regarding claim 3, the void expands naturally along the recited direction as it is inherent in electromigration.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li in view of Lee (Lee et al., US 5,917,244) and/or Kobayashi (US 5,083,183).

The disclosure of Li is discussed as applied to claims 1, 3 and 8 above.

Li does not expressly disclose that the electrically conductive region can be surrounded by a liner region formed of a barrier material and that they can be both in direct contact with the second contact region. However, as evidenced in Lee (Figs. 5-7; also see col. 3, lines 23-30, and col. 12, lines 8-29), one of ordinary skill in the art would readily recognize that such a surrounding protective liner formed of a diffusion barrier material (18a and 22a) is desirable for forming an electrically conductive wire (20a) so as to protect the nearby circuits against any adverse interdiffusion of the wire associated with electromigration in an integrated circuit structure with high integration density. And, one of ordinary skill in the art would also readily recognize that, as

evidenced in Kobayashi (Fig. 4), such direct contact between both of the wire (13) and its liner (14) and the second contact region (17) for reducing contact resistance.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the surrounding protective liner of Lee into the resistor structure of Li with direct contact being formed between both of the wire and its surrounding liner and the second contact region, per the teachings of Kobayashi, so that a resistor structure with reduced interdiffusion and/or reduced contact resistance would be obtained.

### ***Response to Arguments***

Applicant's arguments filed on December 30, 2005 have been fully considered but they are not persuasive.

First, in response to applicant's main arguments that Li does not anticipate the claimed invention after the amendment, it is noted that the film region (a portion of 78 that covers region 64) in Li is readable as the recited liner region since it covers a surface of the layer 64 in a manner substantially same as that in the instant invention, i.e., as that of the liner region 120 covering the conducting region 110 in the elected species of Fig. 1 of the instant invention.

Furthermore, regarding the obviousness rejections, in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some

teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). And, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In this case, Li teaches the claimed invention as defined in claims 1, 3 and 8, except the feature that the conducting region is surrounded by a liner and/or that they can be both in direct contact with the second contact region. Lee is cited to show that one of ordinary skill in the art would readily recognize that such a surrounding protective liner formed of a diffusion barrier material (18a and 22a) is desirable for forming an electrically conductive wire (20a) so as to protect the nearby circuits against any adverse interdiffusion of the wire associated with electromigration, which is especially true, given that the resistor structure of Li is formed in an integrated circuit structure in which high integration density is commonly desirable in the art, and the potential adverse interdiffusion between it and its neighboring element structures would become more serious with increased high integration density. And, Kobayashi is cited to show that lower contact resistance is commonly desirable in the art; and it is art known that the contact resistance can commonly reduced by forming direct contact between a (second) contact region (17) and both of the wire (13) and its liner (14).

Therefore, it would be well within the ordinary skill in the art to incorporate the surrounding protective liner of Lee into the resistor structure of Li with direct contact being formed between both of the wire and its surrounding liner and the second contact region, per the teachings of Kobayashi, so as to form a resistor structure with reduced interdiffusion in an integrated circuit structure having a high integration density and/or reduced contact resistance.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH  
March 6, 2006

A handwritten signature in black ink, appearing to read 'Shouxiang Hu', written in a cursive style.

SHOUXIANG HU  
PRIMARY EXAMINER